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SCIENCE 9

Module 5

Diversity of Living Things

Distance Learning

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Science 9

Module 5

DIVERSITY OF LIVING THINGS

Distance Learning

Alberta EDUCATION

Science 9
Student Module
Module 5
Diversity of Living Things
Alberta Distance Learning Centre
ISBN No. 0-7741-0689-1

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Welcome to Module 5!

We hope you'll enjoy your study of Diversity of Living Things.
To make your learning a bit easier, a teacher will help guide you through the material.

So whenever you see this icon,

turn on your audiocassette and listen.

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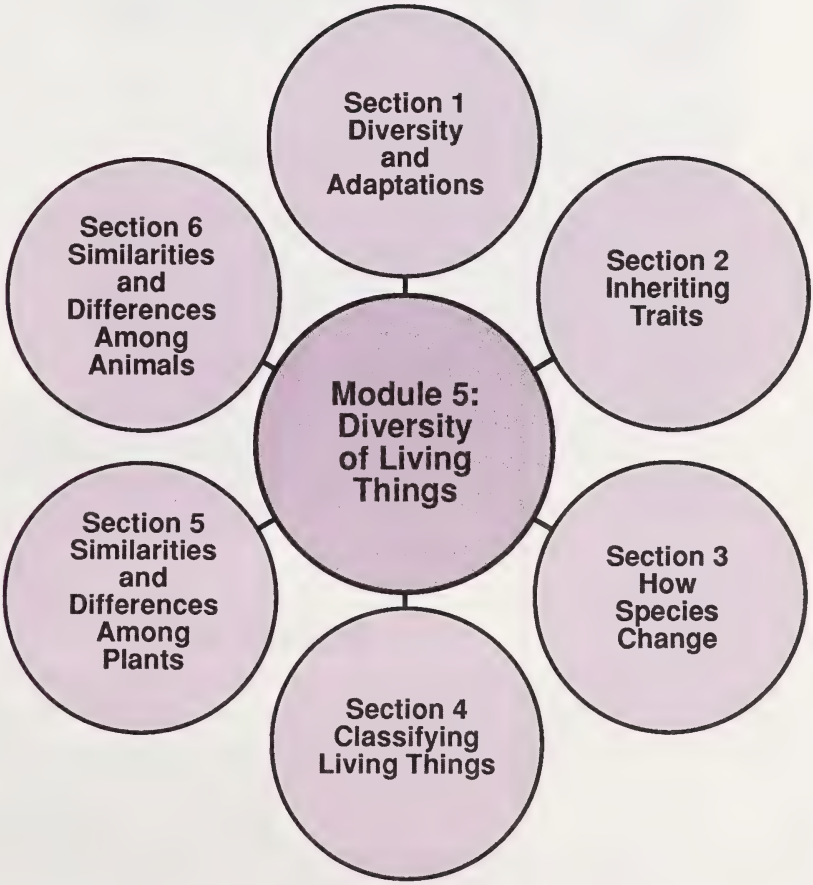
OVERVIEW

Imagine being alone in a park, on a road side, or on a balcony of a high-rise building. Look around! Grass, trees, insects, and birds surround you.

Read page 220 and look at page 221 in *Science Directions 9*. These pages will show you many examples of living things.

This module examines the characteristics of different living things that inhabit the world. You will explore how each is suited to a different environment and how each contributes to the diversity of life. As you learn to classify living things, you will appreciate how living things are related.


Section 1 Diversity and Adaptations
Section 2 Inheriting Traits
Section 3 How Species Change
Section 4 Classifying Living Things
Section 5 Similarities and Differences Among Plants
Section 6 Similarities and Differences Among Animals
Module 5: Diversity of Living Things

Evaluation

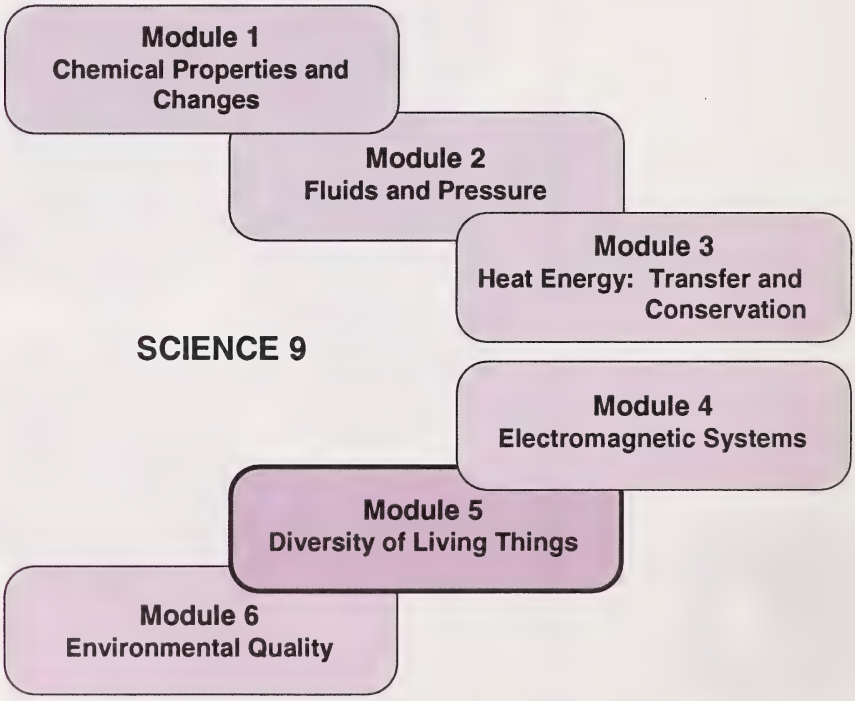
Your mark in this module will be determined by your work in the Assignment Booklet. You must complete all assignments. In this module you are expected to complete six section assignments.

The assignment breakdown is as follows:

Section 1 Assignment	**15%**
Section 2 Assignment	**10%**
Section 3 Assignment	**15%**
Section 4 Assignment	**20%**
Section 5 Assignment	**20%**
Section 6 Assignment	**20%**
TOTAL	**100%**

Course Overview

Science 9 contains six modules. The module you will be working on is highlighted.



Section

1

Diversity and Adaptations

DAVE MORRIS

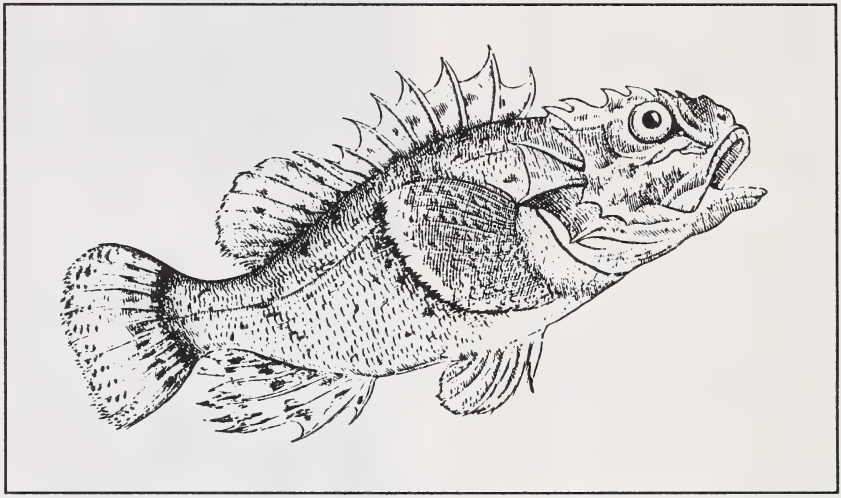
This dog sled team is hard at work! Nature's elements are harsh in this area, but the team moves on! These dogs are selected as working animals because they have adapted to this climate. Even the trees have adapted in order to live here.

In this section, you will identify how living things exist together in many different environments. You will use your observation skills to discover the many features that can be used to tell one living thing from another.

Activity 1: Adaptations for Survival

Plants and animals can be found in every part of the world. Birds that feed on insects fly south for the winter because their food supply does not survive the cold winter weather in northern climates. A poplar tree loses its leaves each winter. The old leaves are replaced by new ones in the spring. Plants and animals have many types of special features or **adaptations** to help them survive.

Adaptation: a structure or behaviour that increases an organism's chances of survival in a particular environment



Do Part A or Part B, or both.

Part A

Read pages 222 to 224 of your textbook to discover more about adaptations.

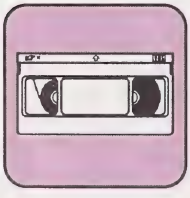
Part B

Watch the videotapes *Adaptations of Animals* and *Adaptations of Plants*.

As you have seen, certain structures help an organism live in a particular place.

The following chart lists several structures found on particular organisms. In the space provided, state the function of the structure and describe possible environments where the organism might live. An example has been done for you.

9 Science Directions

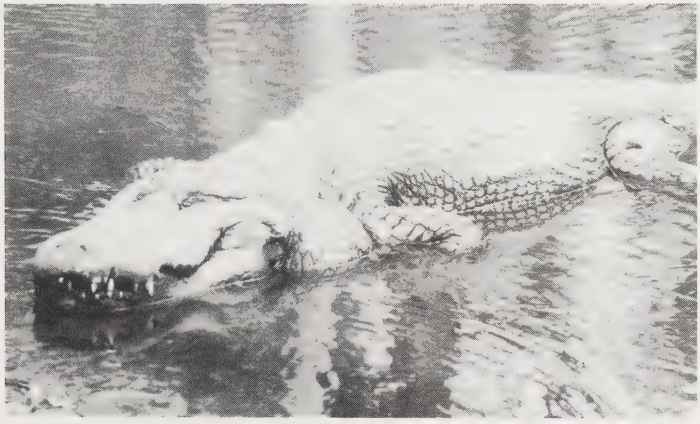


1. Fill in the chart.

Structure	Function of the Structure	Possible Environment
hummingbird beak	collects nectar from deep inside flowers	grassland forest
webbed feet on a duck		
thorns on a rose plant		
wings on a duck		

Check your answers with your learning facilitator.

The structures of an organism can be matched with the specific functions that it needs in order to survive.



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In the investigation that follows, you will discover more structures and features that help specific organisms survive in their environment.

9
Science
Directions

Investigation

Refer to activity 5-1 on pages 224 and 225 of your textbook.

2. What is the problem in this investigation?

_____

_____

Select a simple non-domestic plant or animal to study for this investigation. If you have difficulty making a selection, look through reference books for ideas.

3. The name of your choice is _____.

4. Describe the environment your organism lives in.

_____

_____

_____

_____

_____

_____

5. Draw a sketch or glue a picture of this organism in the middle of the space provided. Allow as much space as possible around your picture for writing comments.

6. Do steps 2, 3, and 4 of the procedure outlined in the textbook. Record the information about your organism around the sketch or picture. The example in the textbook will show you what to do.

7. How many different functions did you label?

_____

Use any source of information about your organism to help you answer the following questions.

8. Answer question 2 of Analysis on page 225 of your textbook.

   Textbook question 2. (a):

   _____

   _____

   _____

   _____

   Textbook question 2. (b):

   _____

   _____

   _____

   _____

9. Answer question 3 of Analysis.

Textbook question 3. (a):

_____

_____

_____

Textbook question 3. (b):

_____

_____

_____

Check your answers with your learning facilitator.

Activity 2: Observing Differences and Similarities

While comparing structures of different living things, you will find many similarities and differences. Look for these similarities and differences in the following activity.

Read page 226 of your textbook to discover how similar and different leaves can be.

Birch

Maple

Paper Birch

Cottonwood

Willow

Aspen

Spruce

Did you discover that the leaves of trees have adaptations that enable them to survive their environment?

1. List one similarity and two differences between the leaves.

2. Describe how leaf shapes may be related to survival in different climates.

Sometimes spotting the differences between living things, rather than looking for similarities, helps you discover more about specific adaptations.

How important are differences between living things? Read page 227 of your textbook to find the answer to this question.

Careful observation and study of these differences allows scientists to group organisms with very similar adaptations.

3. Define the term *species*. Make sure that your definition includes the two aspects that are mentioned in the text.

Check your answers by turning to the Appendix, Section 1: Activity 2.

Even though some living things look like other living things, they can be very different. Examine the following photograph of the butterflies. Look for similarities and differences.

DAVE MORRIS

4. List the characteristics that would help you tell the difference between these butterflies.

Check your answer by turning to the Appendix, Section 1: Activity 2.

Mimicry: a defense mechanism whereby one organism is protected from predators by a close resemblance to another organism

Sometimes a similarity in appearance can fulfill a useful function. This adaptation allows an organism to fool a predator by resembling the features of another organism. This is known as **mimicry**. Many living things use this adaptive feature to keep predators away.

Monarch

Viceroy

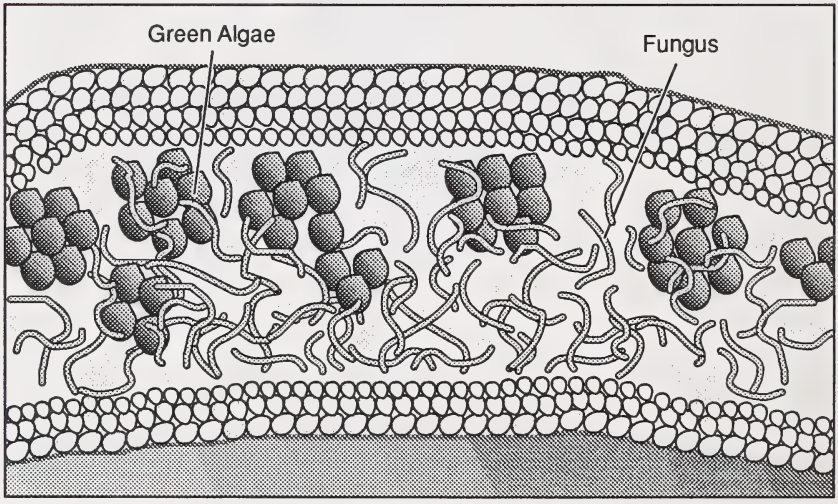
5. The Monarch and Viceroy butterflies are an example of mimicry. Research these insects and describe how mimicry helps the Viceroy butterfly to survive.

Check your answer with your learning facilitator.

Some living things have developed special relationships with other living things in the environment in order to survive. One example is the aphid and the ant. Aphids are small green insects that suck liquid from plants and produce a sweet juice called honeydew. Ants feed off the honeydew that collects on the aphid. In this relationship the ant protects the aphid from predators and the aphid provides a food supply for the ant. Each organism benefits from the relationship. This example demonstrates the beneficial relationship, called **mutualism**, between some organisms.

Mutualism: a relationship between two organisms in which each receives a benefit from the other

A lichen is another example of mutualism. Lichens are actually two organisms that live together on rocky surfaces. One organism is an algae that produces food. The other organism is a fungus that feeds on the food manufactured by the algae. The fungus provides protection and structures for holding water. The union of the fungus and algae forms the lichen. Both organisms benefit each other.



6. Look at the picture below and describe the mutual relationship between these two organisms.

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Check your answer with your learning facilitator.

Activity 3: A Survey of Diversity

A closer look at the organisms that live in a specific environment will help you become more aware of the diversity of living things.

Do either Part A or Part B.

Part A involves going outside and using a field guide in a natural area that has a variety of plants. Part B does not involve going outside.

Part A

=== Investigation ==========

Refer to Activity 5-2 on page 228 of *Science Directions 9*.

1. What is the problem in this investigation?

Collect the materials that are listed.

Choose an area that is approximately 100 m^2 in size.

Caution: Get permission from your supervisor before studying a certain area. Do not remove plants from the area unless your learning facilitator has given you permission to do so.

2. Do step 3 of the procedure.

Read steps 1 and 4 of the procedure. A table has already been prepared for you.

3. Use the following table to do step 4 of the procedure. Observe as many different types of plants as you can. Fill in the table as you observe the area.

Species Name	Approx. Count	Brush, Tree, or Small Plant	Upright, Climbing, or Crawling	Approx. Height (cm or m)	Shape of Leaves	Special Adaptive Characteristics (e.g., Type of Flower or Type of Seed)

Check your answers with your learning facilitator.

Use your completed data table to answer the following questions.

4. Which structures are most common in the plants you described?

5. Answer question 2 of Analysis on page 229 of your textbook.

6. Answer question 3 of Analysis.

Check your answers with your learning facilitator.

Part B

Investigation

For this part use your observation skills to spot the different species of animals and note the similarities and differences among them.

Examine the different species of animals in the following illustration.

7. Describe the area or environment shown in the illustration.

8. Use the preceding illustration to answer this question. Complete the following table by identifying and recording five types of animals in the first column. Count the number of each type of organism that you identified. Record the total in the second column of the table. In the third column on the table, briefly describe the shape, size, body covering, appendages, and other special features of the species that you observe.

Observations

Identifying Feature or Name	Total Number	Description (Shape, Size, Body Covering, Special Features)

The completed table will help you answer the following questions.

9. Name a structure that the blackbirds and frogs have in common.

_____

_____

10. Name a structure which is different in blackbirds and frogs.

_____

_____

11. Select one of the animals and describe how a specific structure helps the animal survive.

_____

_____

_____

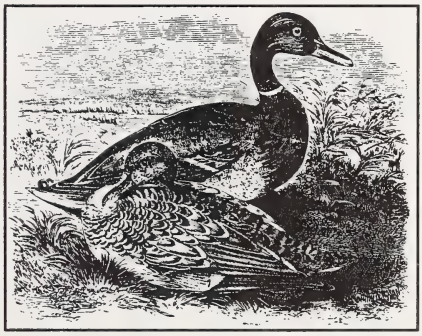
_____

_____

Check your answers with your learning facilitator.

Activity 4: Variations Within Species

Have you ever seen two ducks swimming on a pond and thought they were different species of birds?



Later, did you find out that they were the same species, but one was male and the other female? You would expect members of different species to be different, but organisms within the same species can also be very different from one another.

9 Science Directions

Read pages 229 to 232 in your textbook to discover examples of variations within a species and the advantages this offers to the species.

1. Fill in the following chart to summarize the main points you have just read in the textbook.

Variation	Brief Description	Possible Adaptive Value	Example of Species
	During the life cycle, the organism changes in appearance. New structures may appear (e.g., wings). Old structures may disappear (e.g., legs, gills).	There is less competition for food between organisms of the same species.	Butterfly Frog Beetle
Sexual Dimorphism			Peacock Paper Nautilus
Polymorphism			

2. Describe two examples of how the young members of a species may differ from the adult members. Hypothesize how this may be of adaptive value.

3. Describe two examples of variations that are related to the changing seasons and hypothesize how they are an adaptation for survival.

_____

_____

_____

_____

4. Match the Greek parts of words in Column A to their meaning in Column B.

Column A	Column B
_____ morph	a. many
_____ meta	b. two
_____ di	c. form
_____ poly	d. change

5. Define the following terms in your own words.

metamorphosis: _____

_____

_____

sexual dimorphism: _____

_____

_____

polymorphism: _____

_____

_____

Check your answers by turning to the Appendix, Section 1: Activity 4.

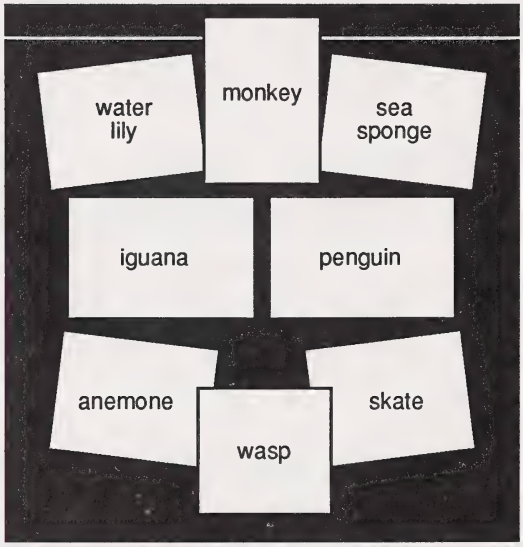
Follow-up Activities

If you had difficulties understanding the concepts in the activities, it is recommended that you do the Extra Help. If you have a clear understanding of the concepts, it is recommended that you do the Enrichment.

Extra Help

The diversity of living things is no accident. Each structure of an organism has a specific function. These structures have enabled the organism to adapt to its surroundings.

Examine the pictures on page 221 of your textbook to review the main adaptive features in living things. The names of the organisms shown are given in the following diagram.



Each organism shown here is capable of self-protection, movement, finding food, and more. Each is suited to its special environment because of the structures that enable it to survive and reproduce.

9
Science Directions

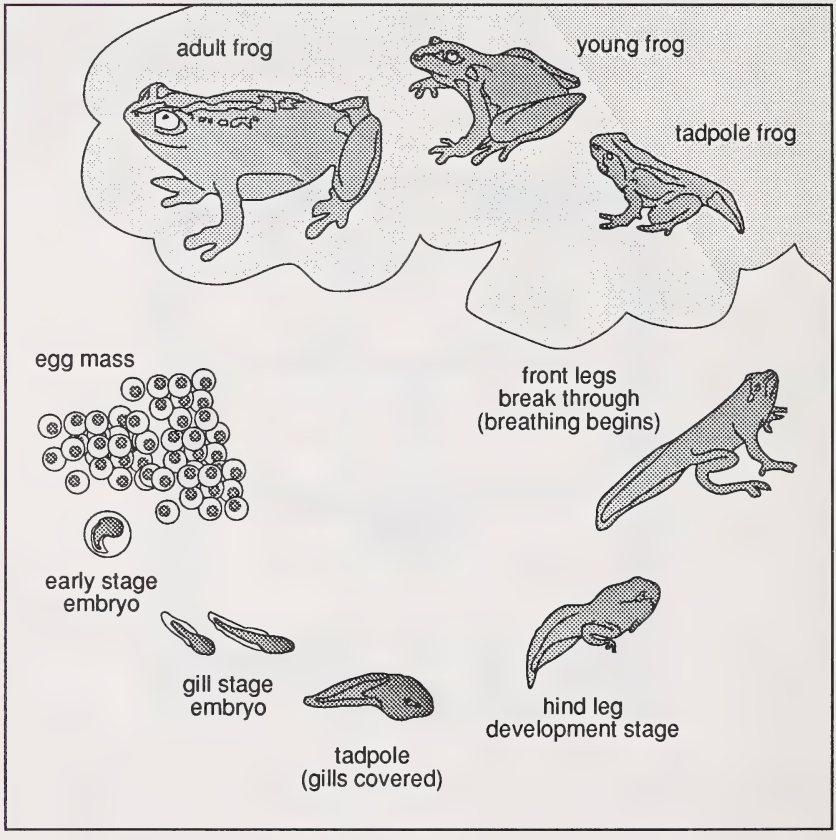
1. Use the following observation chart to help you summarize how each organism on page 221 moves, protects itself, and obtains food. List the special structures it possesses and describe the environment it may live in.

Organism's Name	How Does it Move?	How Does it Protect Itself?	How Does it Obtain Food?	Environment	Special Features

Check your answers with your learning facilitator.

Enrichment

Adaptations of organisms enable them to survive. To learn more about these features, scientific research helps people discover new information about many living things.



1. Examine the life cycle and describe the adaptations that the frog has for each stage in its life cycle. In your description include a variety of adaptations that the frog uses to survive at each stage.

Check your answer with your learning facilitator.

Conclusion

Speed, strength, and agility once enabled relatives of the sled dog to survive in the wild. These same characteristics now help sled dogs to form a relationship with man in which both benefit. Each adaptation of an organism contributes to its survival. The diversity of living things on the earth is a reflection of the many adaptations that have evolved over time to enable organisms to live in many different environments.

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Assignment Booklet

ASSIGNMENT

Turn to your Assignment Booklet and do the assignment for Section 1.

Section

2

Inheriting Traits

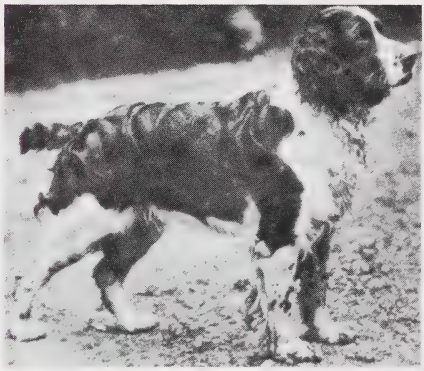
Why does the rider use the horse to help round up these cattle? Why has the rancher chosen to raise only Hereford cattle? Humans develop or choose certain qualities in plants and animals that they find useful.

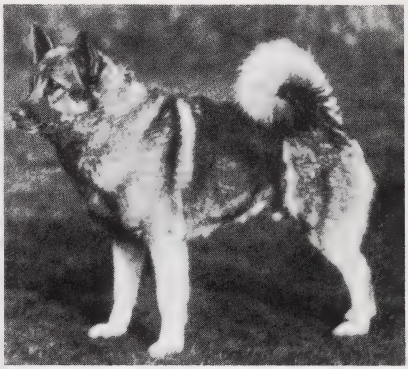
In this section you will discover how important species characteristics or traits are passed from one generation to the next. You will also see how species traits can change over many generations to help a species adapt to a new environment.

Activity 1: Traits

Trait: a term used to describe a characteristic of an organism that is inherited from a parent organism

Specific features, such as the shape of the ears or the colour of a dog, are characteristics or **traits**.





The puppies of these dogs will resemble their parents because their traits will be inherited from their parents. If both parents are from the same breed of dog, the offspring should be almost identical to the parents. Even if the parents are from different breeds, the puppies will have traits that are inherited from one parent or the other.

Read page 234 of your textbook, *Science Directions 9*, to learn more about traits.

9 Science Directions

9 Science Directions

Investigation

Refer to Activity 5-3 on pages 235 and 236 of your textbook.

1. What is the problem in this investigation?

_____

_____

_____

You will be conducting a survey of human characteristics. This survey should consists of at least ten people. There should be no more than three people from one family. You will need a mirror or another person to help make some of your observations.

Do steps 1 to 6 of the procedure. You may use the table provided to record your observations.

2. Place a check mark in the appropriate column beside the form of the trait that best describes you.

Occurrence of Traits in a Group

Trait	Form of the Trait	My Traits (✓)	Group Traits (Place ✓ Beside Each Visible Form)										Percentage of Group with Each Form of the Trait
tongue roller	non-roller												
	roller												
ear lobe attachment	free												
	attached												
thumb shape	curved												
	straight												
number of wrist cords	two												
	three												
hairline shape	straight												
	widow's peak												
		Names											

3. Survey your group or class for their traits. Question one person at a time. Record the information in the preceding table in the section for group traits. Place a check mark in the appropriate column across from the form of the trait that best describes each individual in the group. If a larger group (more than ten people) is surveyed, you may create a separate table to record your information.

4. Count the total number of check marks for each trait, including your own. Then calculate the percentage of each trait in your group. Record the information in the last column of the table.

   If you need assistance to calculate the percentage, use the following example.

   rolled tongue: $\frac{\text{number of traits seen}}{\text{total number in group}} \times 100 = \_\_\_\_\%$

   $$\frac{3 \text{ people rolled their tongues}}{15 \text{ people surveyed}} \times 100 = 20\%$$

5. Examine the percentages of people in your group that have each of the ten different forms of the traits. Order the traits from most common to least common.

Trait	%	Trait	%
1.		6.	
2.		7.	
3.		8.	
4.		9.	
5.		10.	

By doing this survey you will recognize that a variety of human traits can be found in a group of people.

6. How many people that were surveyed have exactly the same combination of traits?

_____

7. Write a generalization about the variation of humans that you observed in this survey of traits.

_____

_____

_____

9 Science Directions

8. Do questions 3, 4, and 5 of Further Analysis on page 236 of your textbook.

   Textbook question 3:

   _____

   Textbook question 4:

   _____

   Textbook question 5:

   _____

9 Science Directions

Traits have been studied for years. Read Did You Know? on page 236 to find out more.

9. What is the science of heredity called?

   _____

Check your answers with your learning facilitator.

9 Science Directions

Activity 2: Reproduction, Genes, and Inheritance

In order to understand how species traits are passed from one generation to another, you should review the two ways that living things reproduce.

Read the summary about reproduction on page 233 of your text.

1. Describe two examples of asexual reproduction.

_____

_____

_____

_____

2. Fill in the following blanks.

Sexual reproduction requires the union of two sex cells or _____. The male sex cell is the _____ and the female sex cell is the _____. They join together during fertilization to form a _____.

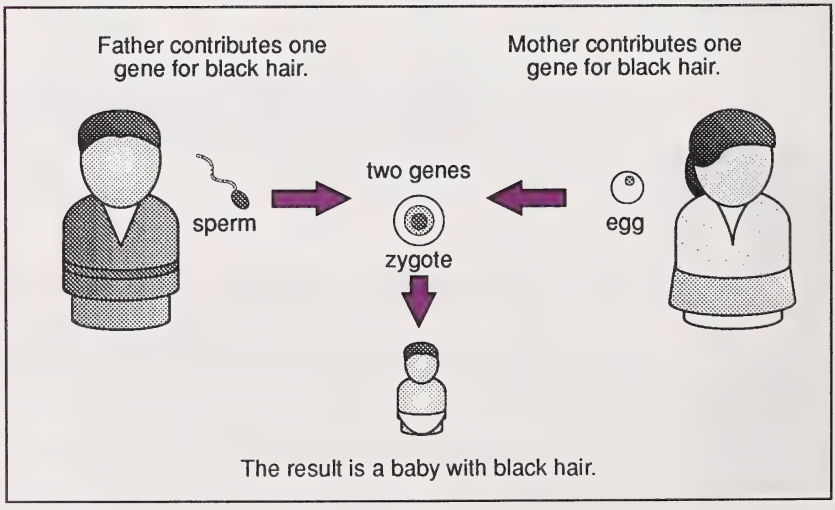
Offspring inherit species traits from their parents. An organism that results from asexual reproduction will be nearly identical to its parents. An organism that results from the union of sex cells will have characteristics of both parents. Traits such as having a straight hairline and being able to roll your tongue demonstrate inheritance. Each trait can be traced to a source in reproductive cells.

9 Science Directions

To find out how traits are passed on, read page 237 in your textbook.

Gene: a unit of chemical code in the nucleus of a cell that controls the reproduction of a specific trait

Genes are the carriers of traits from parents to offspring. Every living thing that reproduces by sexual reproduction inherits a pair of genes for each trait – one gene from each parent.



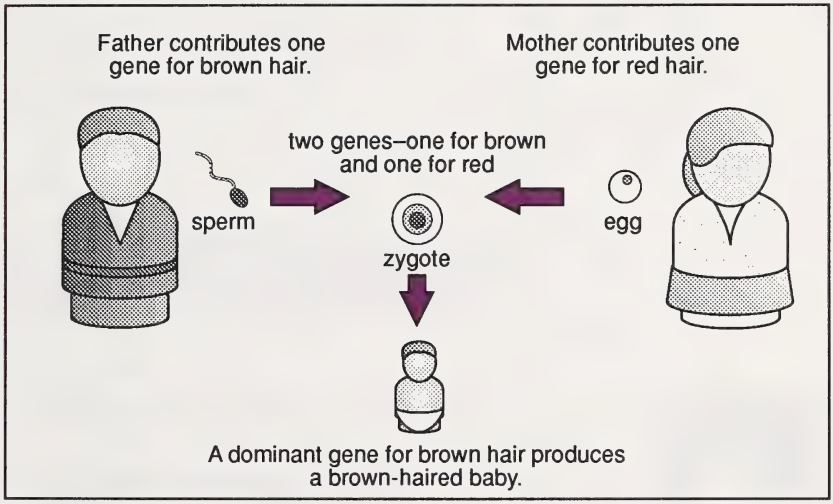
Allele: two or more genes that are coded for the same trait

Dominant gene: a gene that causes a particular trait to be visible or otherwise apparent in a mature organism

Recessive gene: a gene that carries the code for a particular trait even though this trait may not be visible or otherwise apparent in a mature organism

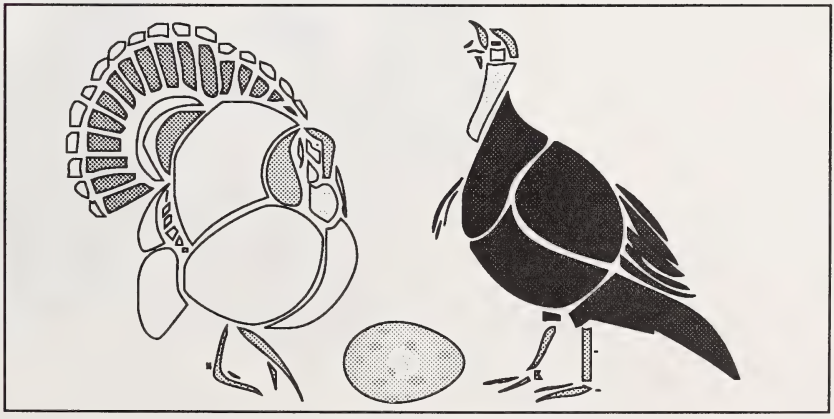
Sometimes, however, the two genes for the same trait, such as hair colour, may be different. Two different forms of the same gene are called **alleles**.

In this case, one gene is normally a **dominant gene** and the other gene is a **recessive gene**. The dominant gene will be the one that determines how a physical characteristics or trait will be expressed.


Father contributes one gene for brown hair.
Mother contributes one gene for red hair.
two genes–one for brown and one for red
sperm
egg
zygote
A dominant gene for brown hair produces a brown-haired baby.

The parents contribute one gene each – one for brown hair and one for red hair. But the baby can only have one colour of hair! The hair colour is therefore determined by the dominant gene, even though two different genes are present in the offspring.

Try this situation. A male turkey contributes the recessive gene for colour. The female turkey contributes the dominant gene for colour.



3. What colour will the offspring be?

_____

4. Why is the inheritance of genes through sexual reproduction a benefit to the overall survival of a species?

_____

_____

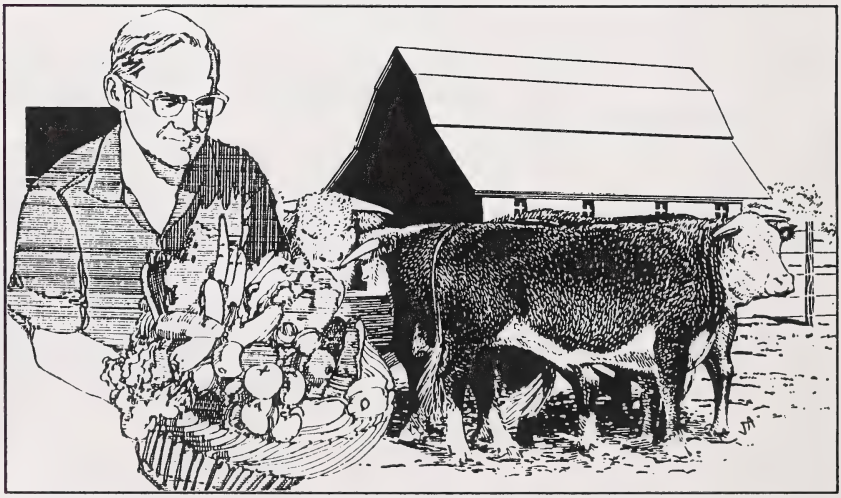
_____

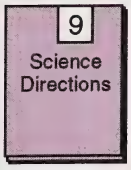
_____

Check your answers by turning to the Appendix, Section 2: Activity 2.

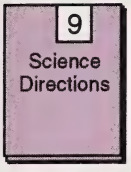
Activity 3: Artificial Selection

If you could talk to farmers who lived in the 1800s, they would tell you that the crops and farm animals used today are much different from the ones used during the 1800s. An understanding of genetics has lead to the development of farm produce with desired characteristics of taste, texture, and colour.





Artificial selection: the deliberate selection of organisms with desired traits for use as breeding pairs



Read about artificial selection on pages 238, 239, and 240 in your textbook.

Humans have selected organisms with specific traits. In this way they can be used to reproduce the next generation. New strains of organisms with desired traits are continually developed by **artificial selection** and planned breeding.

Refer to Activity 5-4 on page 240 in your textbook.

1. Do question 1 of the activity.

   Textbook question 1:

   a. race horses _____

   _____

   b. apple trees _____

   _____

   c. turkeys _____

   _____

   d. hunting dogs _____

   _____

   e. guard dogs _____

   _____

   f. roses _____

   _____

   g. beef cattle _____

   _____

   h. dairy cattle _____

   _____

   i. rodeo cattle _____

   _____

j. sheep _____

_____

k. corn _____

_____

l. wheat _____

_____

2. Answer question 2 of the activity.

_____

_____

_____

_____

3. Answer question 3 of the activity.

_____

_____

_____

_____

Check your answers with your learning facilitator.

Follow-up Activities

If you had difficulties understanding the concepts in the activities, it is recommended that you do the Extra Help. If you have a clear understanding of the concepts, it is recommended that you do the Enrichment.

Extra Help

Suppose you wanted to use selective breeding to increase the milk production of your dairy herd.

1. List the traits that you would like to see in an improved dairy herd.

_____

_____

_____

As a first step, you might breed your milk cows with a bull that carries the desired traits. This breeding produces both male and female calves or offspring.

2. Could you tell if a newborn female offspring has the desired traits? Explain.

_____

_____

3. What is the next step in your breeding program after you have identified the most productive offspring?

_____

_____

4. As a result of artificial selection, how should the milk production of the dairy be at this point?

_____

_____

To complete the selective breeding program, you might breed half the offspring of this program with a different breed of bull that also carries genes for desired traits. The offspring would help you establish a second herd from which you could select breeding stock.

By selecting the best producers from both herds as breeding stock, you will maintain the health and productivity of your overall herd.

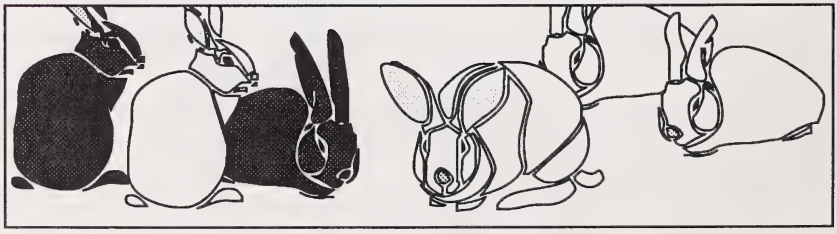
5. As a dairy farmer, would you agree with this practice of selective breeding? Why or why not?

Check your answers by turning to the Appendix, Section 2: Extra Help.

Enrichment

Through artificial selection humans have been able to select the traits that they desire in a variety of foods, and in the animals that they care for. These desired traits are crossed to produce offspring through many breeding cycles of selective breeding. A pure breed is finally created when offspring with the same traits are crossed.

Suppose you are raising rabbits. Some of your rabbits are black and many are white. Some have long ears others have short ears.



1. Name the traits described in the previous paragraph.

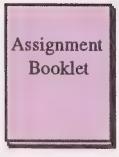
2. Describe how you would develop a pure breed of rabbits that would be white in colour and have long ears.

3. Would new varieties of living things be developed if humans were not present to act as the selector? Why or why not?

Check your answers with your learning facilitator.

Conclusion

Reproduction, genes, and inheritance create diversity in living things. All living things pass on their traits to their offspring. Artificial selection and planned breeding of plants and animals enhances traits that people find desirable.



ASSIGNMENT

Turn to your Assignment Booklet and do the assignment for Section 2.

Section

3

How Species Change

DAVE MORRIS

The coyote must be an effective hunter to obtain food for itself and its offspring. The prey faces a different struggle for survival against many predators. The principle of natural selection ensures that only the fittest will survive.

Plants and animals must also be able to withstand changes in climate. Only 10 000 years ago, the prairies were covered by a thick layer of glacial ice. When the ice melted and the climate warmed, new animals and vegetation from the south replaced the arctic types. As our climate continues to change, dryness, pests, and diseases may mean the death of species that cannot adapt.

In this section you will learn about the process of natural selection. You will also examine the evidence that organisms have adapted to changes in their natural environment as a result of this process.

Activity 1: Traits and Survival

9 Science Directions

Read the first paragraph on page 242 in your textbook.

You have learned about some of the traits that enable living things to survive in their environment. The important traits for the survival of a species range from protective body coverings to reproductive features such as multiple births. However, every species has the potential to over-produce its own kind. Under normal conditions many factors keep the populations in check. For members of a species to survive and reproduce, they must first reach maturity.

Investigation

9 Science Directions

Refer to pages 242, 243, and 244 in your textbook.

1. What is the problem for this investigation?

_____

_____

_____

- Read step 1 of the procedure. If you are working alone, ask a parent or a friend to assist you by keeping time.
- Collect the materials that you will need.

2. Do steps 3 to 9 of the procedure. Use the following tables to record your data. One table is for a test conducted on a large white sheet of paper, the other is for a test conducted on a large black sheet of paper. If you are working independently, you must repeat steps 6 to 9 using a second large coloured sheet of paper. If you are working with another group, each group may test a different background colour.

Caution: You must rest after sucking the straw to prevent yourself from fainting.

In the following tables, the word "moths" refers to the pieces of paper used to represent moths in this activity.

Survival Rate of Moths on a White Background

	No. of White Moths at Start	No. of Black Moths at Start	No. of White Moths at End	No. of Black Moths at End	Total No. of White Moths with + 50%	Total No. of Black Moths with + 50%
1st Generation						
2nd Generation						
3rd Generation						
4th Generation						
5th Generation						

Survival Rate of Moths on a Black Background

	No. of White Moths at Start	No. of Black Moths at Start	No. of White Moths at End	No. of Black Moths at End	Total No. of White Moths with + 50%	Total No. of Black Moths with + 50%
1st Generation						
2nd Generation						
3rd Generation						
4th Generation						
5th Generation						

Use your data tables to answer the following questions.

3. Do questions 1, 2, and 3 of Analysis on page 244 of your textbook.

   Textbook question 1:

   _____

   _____

Textbook question 2:

Textbook question 3:

Check your answers with your learning facilitator.

Activity 2: The Case of the Peppered Moth

The peppered moth is an example of an organism that has survived changes in its environment. How has it changed? Read page 245 in your textbook to find out.

1. Today most factories are trying to eliminate smoke emissions from their smokestacks. If this practice continues, what trait of the peppered moth will aid in its survival? Why?

Check your answer by turning to the Appendix, Section 3: Activity 2.

Natural selection: a process in nature whereby organisms not suited for their environment do not survive
In this way the better adapted organisms are selected as a breeding population.

9 Science Directions

Activity 3: The Theory of Natural Selection

Even organisms that are well-adapted to their environment must struggle to survive by protecting themselves from danger, obtaining food, and reproducing. The organisms that do survive pass on their traits to the next generation.

To discover how animals in nature compete for survival, read pages 246 and 247 in your textbook.

You have probably noticed that natural selection is much like artificial selection. In natural selection, the environment determines the traits that are useful for survival. In artificial selection, man selects the desired traits.

1. Summarize the steps in the process of natural selection that caused a change in the traits found in the general population of peppered moths.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

9 Science Directions

Read Did You Know? on page 248 in your textbook.

2. What did Darwin mean by "survival of the fittest"?

_____

_____

_____

Check your answers by turning to the Appendix, Section 3: Activity 3.

Activity 4: The Appearance of New Species

Today some species are favoured in the environment, but tomorrow other species may be more favoured in a new environment.

Read about how new species may appear on page 248 of your textbook.

Investigation

Refer to Activity 5-6 on page 249 of your textbook.

Read and follow the illustrations about this example of changes in species of fish.

1. Do questions 1 and 2 of Analysis.

   Textbook question 1:

   _____

   _____

   _____

   _____

   _____

   _____

   Textbook question 2:

   _____

   _____

   _____

   _____

   _____

   _____

Bacteria and other microscopic life forms tend to develop new species in short periods of time. Viruses change very quickly. For example, different strains of the flu are caused by a virus that changes every year so that a new type of flu spreads over a population year after year.

2. Why do microscopic life forms develop new species in a short period of time?

Check your answers by turning to the Appendix, Section 3: Activity 4.

You have learned that several new species can evolve from a single parental species over thousands of years. These new species will be similar to each other. The new species can in turn evolve into a newer species. These newest species will probably be more varied.

Species that have many features in common likely have few generations separating them from their parental species. Species that are very different from each other likely have many generations separating them from their parental species – the parental species likely lived millions of years ago.

The idea that new species can develop from a single species gives rise to the concept of relatedness. The more closely related species are considered to be, the more recently they evolved from their single parental species.

3. Make a hypothesis. Tell how you think the following animals can be grouped according to their relatedness.

bear	horse
dog	wolf
donkey	zebra

Read page 250 in your textbook to discover some examples of how some species are related.

4. What are the common inherited traits shared by horses and zebras?

_____

_____

5. How have the zebra and the horse adapted to their particular environments?

_____

_____

_____

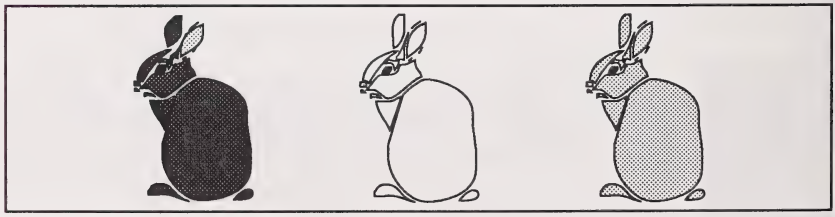
Check your answers by turning to the Appendix, Section 3: Activity 4.

Follow-up Activities

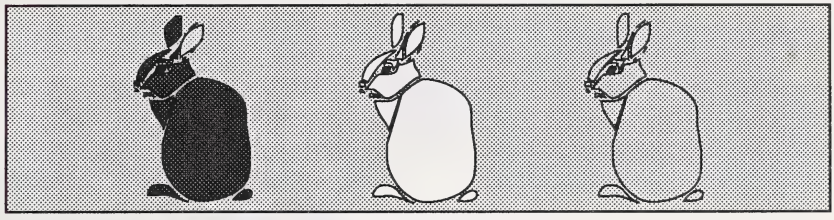
If you had difficulties understanding the concepts in the activities, it is recommended that you do the Extra Help. If you have a clear understanding of the concepts, it is recommended that you do the Enrichment.

Extra Help

Organisms within a species can look very much alike, but they can show many variations in traits.



Some of these variations will affect the organism's ability to protect itself, hide from predators, or gather food. If a trait contributes to the survival of the species, it will be passed on to future generations. Only species that can adapt to their environment will survive in nature.



1. Which of these rabbits has the best chance to hide from a predator?

_____

Suppose you transplant two cacti of the same species from the desert. One plant is transplanted into a humid greenhouse environment. The other plant is transplanted into an environment similar to the conditions in the desert.

2. Give a reason why it is important to transplant a plant into a familiar environment.

_____

3. If the cactus was to survive in the humid greenhouse, which traits of the cactus would enable it to survive?

_____

_____

4. Do question 2 of Checkpoint on page 263 in your textbook.

_____

_____

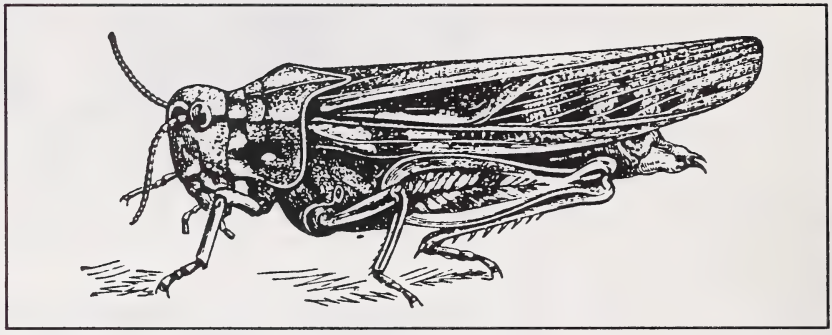
_____

_____

Check your answers with your learning facilitator.

Enrichment

The application of pesticides can control insect populations. When the pesticide DDT was first introduced to control insect pests like the grasshopper, the population of the pests decreased. After a few years of spraying, the numbers of grasshoppers increased and spraying seemed to have little effect.



1. Describe how and why the numbers of grasshoppers increased after years of spraying.

2. What other methods, besides spraying, could be used to control insect pests?

3. What are the advantages of alternatives to spraying?

_____

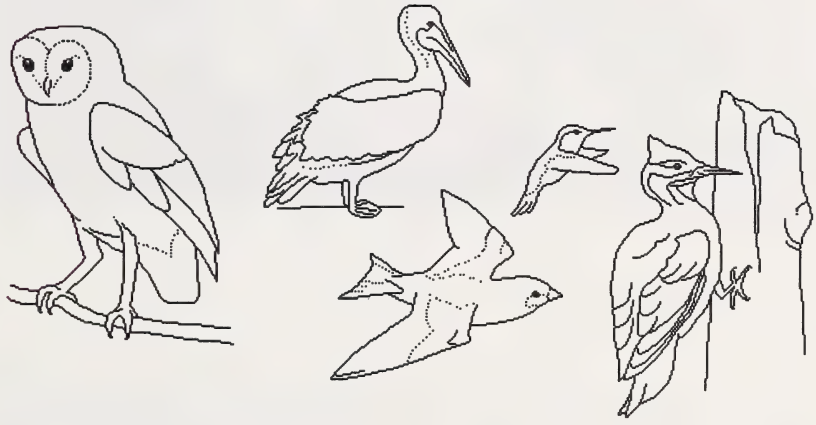
_____

_____

Check your answers by turning to the Appendix, Section 3: Enrichment.

Conclusion

In nature the environment selects the living things that are best suited for survival. Natural variation within a species and natural selection ensures that there will be a species suited for every possible environment on Earth. This has produced an incredible variety of living things, as you will see in the next section.



ASSIGNMENT

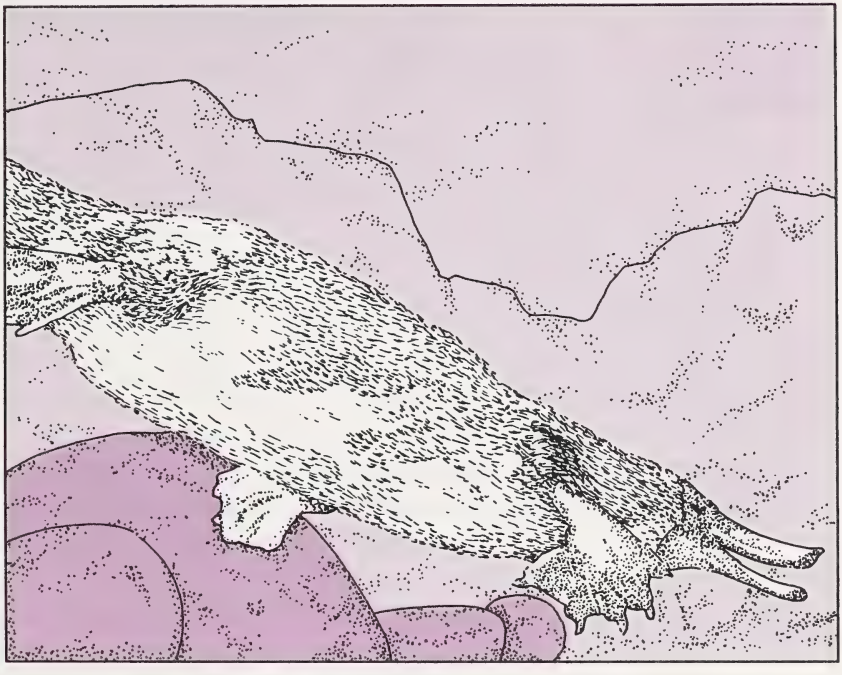
Turn to your Assignment Booklet and do the assignment for Section 3.

Assignment Booklet

Section

4

Classifying Living Things



If you had to decide what kind of animal this is, you might start comparing it to other animals that you are more familiar with. It has webbed feet and a bill. Is it a bird? On the other hand, it also has fur and claws for digging. Is it a mammal?

Millions of different kinds of living things exist on Earth. Scientists have spent many years comparing and classifying these living things.

In this section you will see how living things fit into large groups of similar organisms which can be subdivided into smaller groups of closely related species.

Activity 1: Five Kingdoms

To get a better understanding of plants and animals, it is convenient to sort them into groups with common features.

Begin by reading pages 251 to 254 in your textbook.

1. Write a brief statement that describes each of the five kingdoms of living things.

   a. Monera: _____

   _____

   _____

   b. Protista: _____

   _____

   _____

   c. Fungi: _____

   _____

   _____

   d. Plantae: _____

   _____

   _____

   e. Animalia: _____

   _____

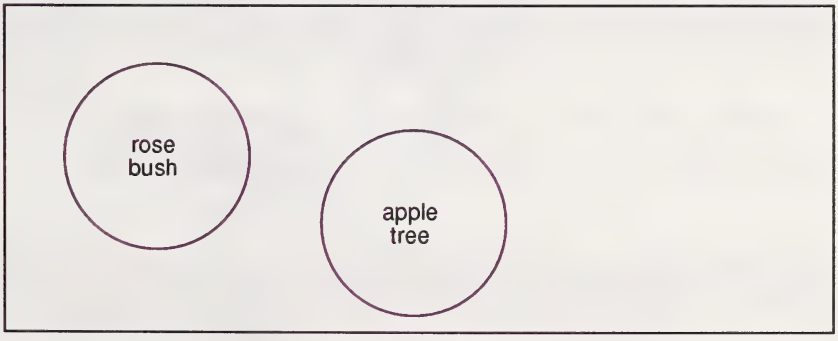
   _____

Check your answers with your learning facilitator.

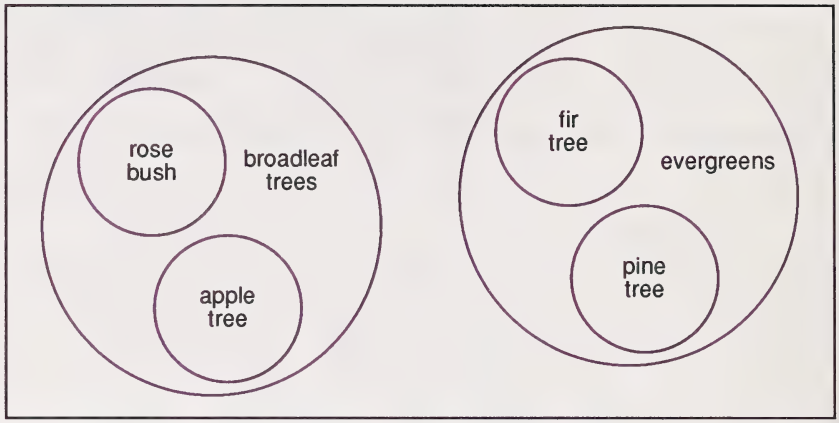
Activity 2: A Hierarchical System

Suppose you were given a rose bush, a pine tree, a fir tree, and an apple tree and were told to group them to show the relationships between them. You can see a major difference between a rose bush and a pine tree; the rose bush produces a flower and the pine tree produces a cone. The diagram below demonstrates this difference by using distance.

A rose bush and an apple tree have a closer relationship that is based on structure. They both produce flowers, but have some other distinct differences. The diagram that uses distance might look like this.

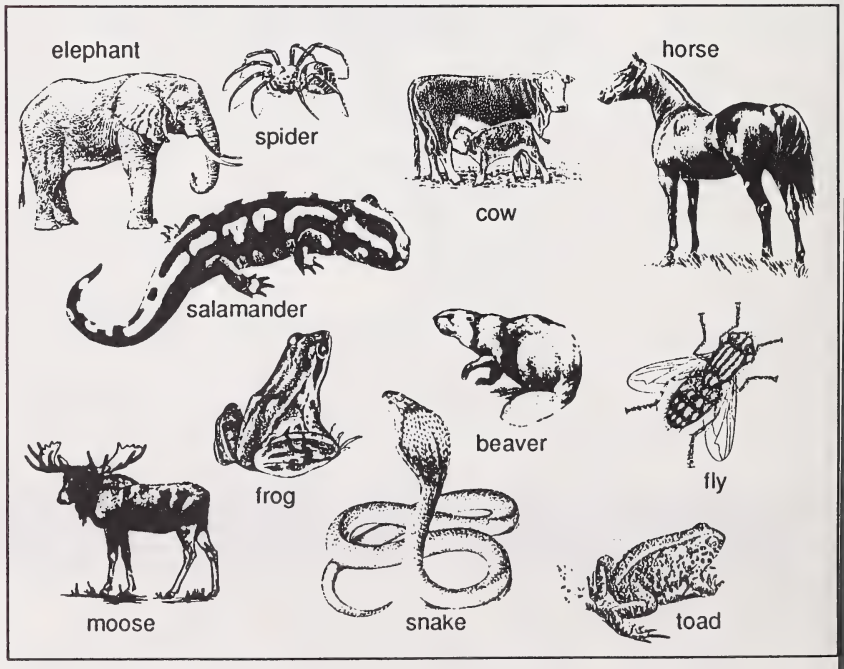


The relationship between the rose bush, pine tree, fir tree, and apple tree might be represented like this.



In general, the distance between the circles demonstrates the similarities and differences between organisms.

1. Use diagrams that use circles and distance to indicate the general similarities and differences between the following animals.

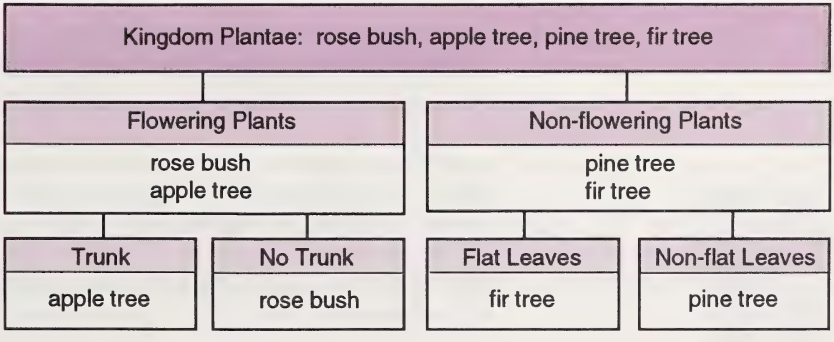


Use the provided space for your chart.

Check your answers with your learning facilitator.

Hierarchy: a system of grouping by levels where groups at each level are subdivided to produce subgroups at a lower level

The **hierarchy** of living things is much the same as the circle type of diagram, except the concept of levels is used instead of distances. A hierarchy is divided into hierarchical levels. The top levels are general groupings and the lower levels are specific types within the larger group.



2. Try designing your own hierarchy of the animals from question 1. Each level in the hierarchy should have a title that informs people what the grouping is based on. Use the provided space for your answer.

Check your answers with your learning facilitator.

By grouping organisms relative to their structure and traits, you are classifying them. The methods used by scientists to classify living things are similar to the methods you used, but are more complex.

Read more about a hierarchical system used to classify living things on page 255 in your textbook.

3. Name the levels of hierarchy that are used for classifying living things. List the levels in order from the most specific to the most general.

_____

_____

This hierarchical system was developed through extensive research. With practice, you will be able to use this system to classify or name any organism that is unfamiliar to you.

Read about naming organisms on page 256 of your textbook.

4. Who developed the naming and classification system that uses Latin terms?

_____

Refer to Activity 5-7 on page 257 of your textbook. Read Name That Species.

5. Do the naming activity that is explained in Name That Species. Combine the Latin terms to create at least eight scientific names that match the common names of the animals pictured on page 257. Record your answers in the following table.

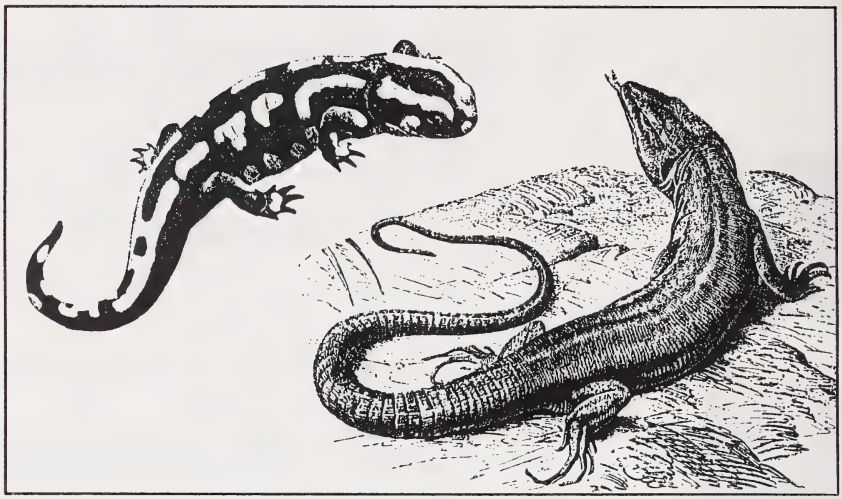
Common Name	Latin or Greek Name

Classifying living things can be exciting and challenging. Flowering plants first need to bloom in order to be properly identified. Some animals must mature before they can be identified. Some species are so closely related that minor internal details must be used to classify them.

9
Science Directions

Read The Usefulness of Classification on pages 258 and 259 in your textbook.

A salamander and lizard may look very much alike, but they actually are quite different. Do some research in available references to find out how they are alike and how they are different.



6. What are some of the differences between a lizard and a salamander?

_____

_____

_____

_____

7. Why are lizards and salamanders in the same phylum, but not in the same order?

_____

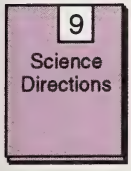
_____

_____

_____

Check your answers with your learning facilitator.

Dichotomous key: a list of alternative characteristics used for classification



Activity 3: Keys to Identification

You can identify an unknown organism by using a **dichotomous key** and following the steps in the key to locate the name of the organism.

Read Keys to Identification on page 259 and Using a Dichotomous Key on the top of page 260 in your textbook.

Investigation

Refer to Activity 5-8 on page 260 in your textbook.

1. Do steps 1, 2, and 3 of the activity. Use the provided space for your answers.

   a. _____

   b. _____

   c. _____

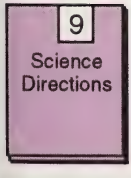
   d. _____

   e. _____

   f. _____

   g. _____

Check your answers by turning to the Appendix, Section 4: Activity 3.



Follow-up Activities

If you had difficulties understanding the concepts in the activities, it is recommended that you do the Extra Help. If you have a clear understanding of the concepts, it is recommended that you do the Enrichment.

Extra Help

Refer to pages 251 to 262 in your textbook for help in completing the following crossword puzzle.

Across

2. also means warm-blooded

6. _____ are used to group living things.

7. Organism that produce their own food are in the kingdom _____.

8. an organism that belongs to the Kingdom Fungi

10. Organisms in this group do not contain chlorophyll, may be unicellular or multicellular, and were once thought to be plants.

11. a North American ungulate with horns in a backward swirl

12. A system that divides groups into levels from general to specific is said to be _____.

14. Animals that produce milk are known as _____.

16. separation into groups with similar characteristics

Down

1. The first part of a scientific name is the name of the _____.

3. The special arrangement of statements to identify organisms is a _____ key.

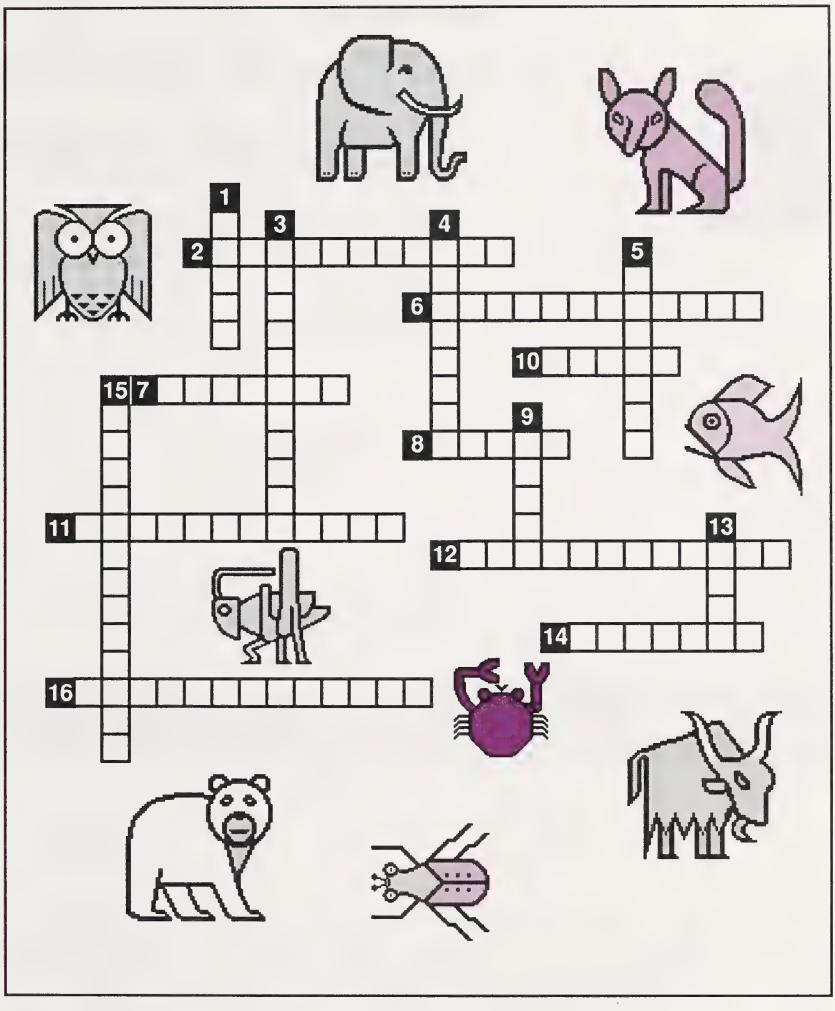
4. This fungi may have colourful tops.

5. the most general group in the Linnaean classification system

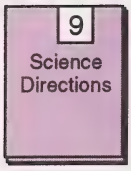
9. the person who developed the system of grouping

13. Most protists have only one _____.

15. Kingdom Animalia consists of food dependent organisms that are _____.



Check your answers by turning to the Appendix, Section 4: Extra Help.



Enrichment

Read Making a Dichotomous Key on pages 261 and 262 in your textbook.

1. Do Activity 5-9 on page 262. In this activity you will need to obtain five to ten different leaves from trees and bushes.

   You can even find leaves in the winter! Evergreen trees, house plants, and fresh produce provide an excellent source of plant material.

   a. Use this space for your diagram.

b. Use this space for your dichotomous key.

Check your answers with your learning facilitator.

Conclusion

Scientists continue to find new species and classify them based upon the system developed by Carlos Linneaus in the 18th century. The five kingdoms form the basic groups of all living things and begin the process of classification. Hierarchical levels below each kingdom are created with more specific information. As you use this system of classification to identify living things, you will come to recognize the order of living things and understand more about their nature.

Assignment Booklet

ASSIGNMENT

Turn to your Assignment Booklet and do the assignment for Section 4.

Section

5

Similarities and Differences Among Plants

DAVE MORRIS

You can see some of the similarities and differences between the plants and trees in the preceding photograph. The distinguishing features are visible, but many other differences exist between them that make them very unrelated.

In this section you will identify the general features of the Plant Kingdom.

9
Science Directions

Activity 1: Mosses and Ferns

Mosses and ferns belong to two major phylums of Kingdom Plantae.

For details about mosses and ferns read pages 266, 267, and 268 in your textbook.

1. Define the term *photosynthesis*.

2. Define the term *autotroph*.

3. a. What phylum do mosses and liverworts belong to?

   b. What environment do mosses and liverworts live in?

   c. What are the general features of this phylum?

   d. What are the special adaptations of this phylum?

   e. What type of reproduction occurs in this phylum?

   f. What structure gives rise to new moss and liverwort plants?

4. a. What phylum do ferns belong to?

_____

b. What environment do ferns live in?

_____

_____

c. What are the general features of the ferns?

_____

_____

_____

_____

d. What are some special adaptations of this phylum?

_____

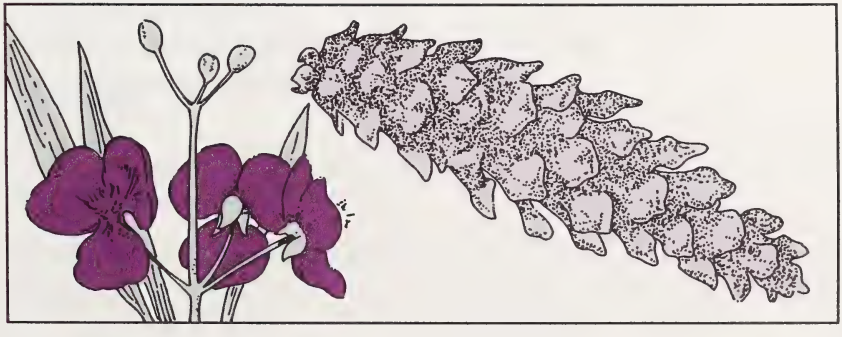
e. What type of reproduction occurs in this phylum?

_____

Check your answers by turning to the Appendix, Section 5: Activity 1.

Activity 2: Seed-Bearing Plants

Flowers and pine cones both produce seeds to ensure the survival of seed-bearing plants.



9 Science Directions

Read about seed-bearing plants on pages 269 and 270 in your textbook.

1. Name and describe the main difference between the two groups of seed-bearing plants.

2. a. What is the best known phylum of exposed-seed plants?

   b. What are the general features of this phylum?

   c. What are the special adaptations of this phylum?

   d. What type of reproduction occurs in this phylum?

3. a. What group do flowering plants belong to?

b. What is the basis for division of angiosperms into families?

_____

_____

c. What are the general features of angiosperms?

_____

_____

_____

_____

d. What are some special adaptations of this group?

_____

_____

_____

e. What type of reproduction occurs in this group?

_____

_____

Check your answers by turning to the Appendix, Section 5: Activity 2.

Follow-up Activities

If you had difficulties understanding the concepts in the activities, it is recommended that you do the Extra Help. If you have a clear understanding of the concepts, it is recommended that you do the Enrichment.

Extra Help

Use the information about plants on pages 266 to 271 in your textbook to help you answer the following questions.

1. Where do mosses and ferns naturally live?

_____

2. Which step of the moss or fern life cycle restricts them to remain in this environment?

_____

3. What is a seed?

_____

4. State two things about the reproduction of flowering plants that have made them the most successful group of plants.

_____

_____

Check your answers with your learning facilitator.

Enrichment

Select a plant of your own choice and do some research about its environment, reproduction, and life cycle.

1. Sketch the plant and label its major parts. Use the space provided.

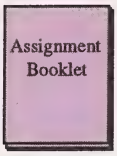
2. Describe the major adaptive features of the plant and its environment.

3. Draw and label the steps of its life cycle.

Discuss your answers with your learning facilitator.

Conclusion

You have just discovered that each plant has its own distinctive characteristics, adaptations, life cycle, and place in the environment. The major groups of Kingdom Plantae are the mosses, ferns, gymnosperms, and angiosperms. Most of the familiar plants are found in the seed-bearing groups. The seed-bearing plants have been the most successful land plants because of their ability to adapt to a wide range of environments.



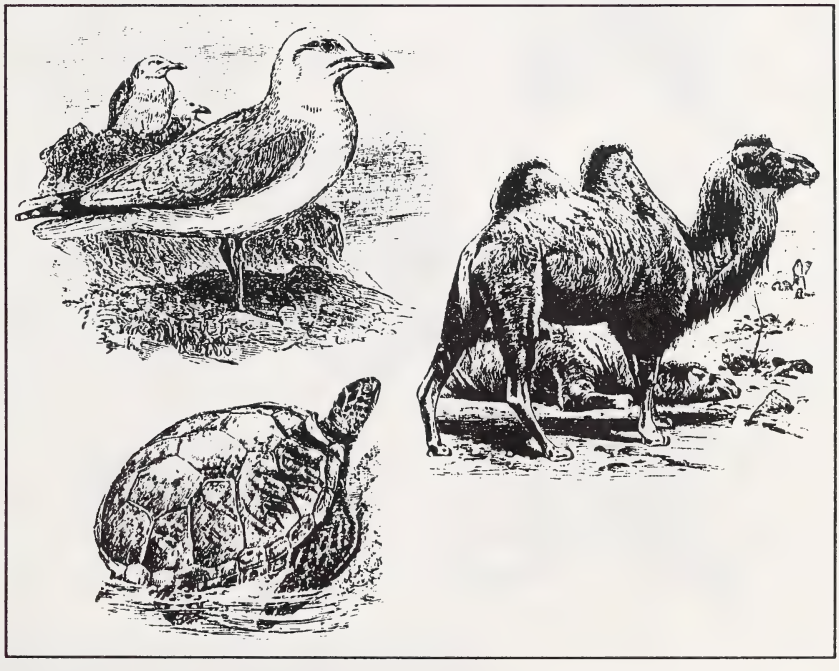
ASSIGNMENT

Turn to your Assignment Booklet and do the assignment for Section 5.

Section

6

Similarities and Differences Among Animals



How many different types of animals can you think of? Right, there are many! Animals are able to exist from the depths of the seas to the tops of the highest mountains. Each animal has special characteristics that enable it to survive in its environment.

In this section you will learn to identify the features of some of the major groups of animals that inhabit the world.

9
Science Directions

Activity 1: Characteristics of Animals

Read the first paragraph on page 272 of your textbook.

1. Define the term *heterotroph*.

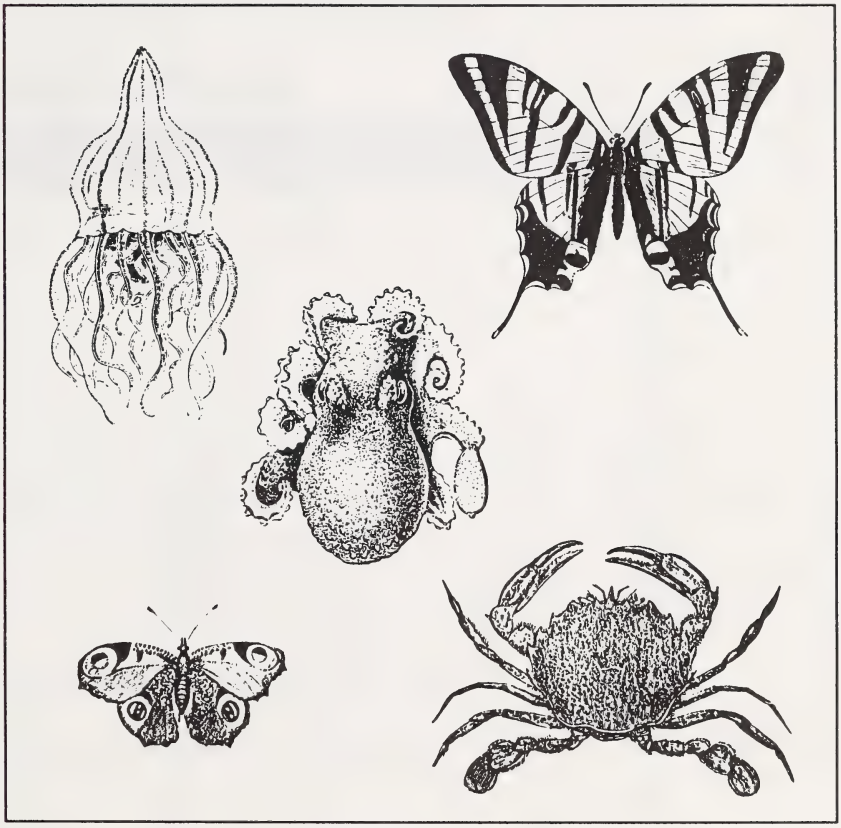
2. List three characteristics of animals.

3. Describe the basic difference between plants and animals.

Check your answers by turning to the Appendix, Section 6: Activity 1.

Activity 2: Animals Without Backbones

The Animal Kingdom has an abundance of species without backbones. Read about these fascinating animals on pages 272 to 277 of your textbook.



1. In general, which method(s) of reproduction do animals without backbones use?

_____

_____

2. Name the five classes within the phylum Arthropoda.

_____

_____

3. Fill in the following table to summarize the information about the major phyla which represent animals without backbones. In the first column, name the phylum. In the second column, summarize the features that characterize the phylum, such as the presence of certain systems and life cycles. In the third column, name the general environment(s) that the animals in the phylum have adapted to live in.

Animals Without Backbones

Phylum	Characteristics of the Phylum	Environment
a.		
b.		
c.		
d.		

Phylum	Characteristics of the Phylum	Environment
e.		
f.		
g.		
h.		

Check your answers with your learning facilitator.

9
Science Directions

Activity 3: Chordates

Animals with backbones have an internal skeleton and belong to the phylum Chordata. Read pages 279 and 280 to discover more about chordates.

1. What types of environments do chordates live in?

2. Name the dominant sub-phylum in the phylum Chordata.

3. What does the term *vertebrate* mean?

4. What are the six main groups of vertebrates?

Check your answers with your learning facilitator.

Vertebrate animals have similar patterns of reproduction. Their life cycles vary in each species, but all vertebrates reproduce sexually. The female of the species produces **egg cells** and the male produces the **sperm cells**. The egg and sperm unite during **fertilization**. The fertilized egg will develop into an **embryo**, and later into a **fetus**, under proper conditions of incubation. After birth, the young animals continue to grow and develop into mature sexual animals.

Egg cell: *the female reproductive cell*

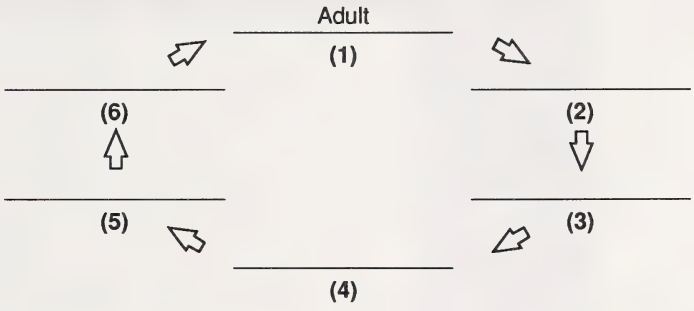
Sperm: *the male reproductive cell*

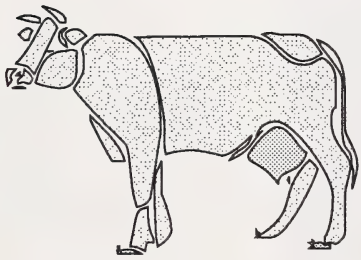
Fertilization: *the union of sperm and egg to form a zygote or fertilized egg*

Embryo: *an early form of a developing organism where a complete set of organs has not yet formed*

Fetus: *a developing organism where a complete set of organs is present*

5. Use the information from the text and the previous statement to fill in the steps for the general life cycle of most vertebrates.





Discuss your answers with your learning facilitator.

Chordates have many similarities and differences among them. Read pages 279 and 280 in your textbook to help you understand how chordates are classified.

6. Fill in the chart to highlight the characteristics, environments, and names of common species of chordates.

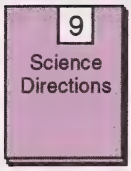
Class	Major Characteristics and Adaptations	Environment	Species
Jawless fish			
Jawed fish (cartilage)			
Jawed fish (bony)			
Amphibians			

Class	Major Characteristics and Adaptations	Environment	Species
Reptiles			
Birds			
Mammals			

Check your answers with your learning facilitator.

Follow-up Activities

If you had difficulties understanding the concepts in the activities, it is recommended that you do the Extra Help. If you have a clear understanding of the concepts, it is recommended that you do the Enrichment.



Extra Help

Use the information from pages 272 to 280 in your textbook to help you answer the following questions.

1. Create a phrase or riddle to help you remember a major feature of each of the major groups of animals. The first one is done as an example.

   a. Porifera: all pores, mouth, and water

   b. Cnidaria: _____

   _____

   c. Platyhelminthes: _____

   _____

   d. Nematoda: _____

   _____

   e. Annelida: _____

   _____

   f. Mollusca: _____

   _____

   g. Echinodermata: _____

   _____

   h. Arthropoda: _____

   _____

   i. Chordata: _____

   _____

2. Fill in the blanks with the appropriate word or phrase about animals.

   a. Insects belong to the phylum _____ .

   b. A soft-bodied animal that has many tentacles is the _____.

   c. A type of flatworm which is parasitic is the _____.

   d. The simplest class of vertebrates with only two living species is the _____.

   e. Birds are the only animals which have _____.

   f. The class of vertebrates which lay leathery eggs are the _____.

   g. A _____ represents the stages of the development of most animals.

Check your answers by turning to the Appendix, Section 6: Extra Help.

Enrichment

Do Part A or Part B.

Part A involves writing a descriptive story. Part B involves doing an activity that involves classifying animals.

Part A

Can you imagine being a certain animal and struggling to survive each day? In this activity you will select an animal, give it a name, and write a short story about it.

1. Choose an animal and write a short animal adventure story about it. The story must contain a setting (where the animal lives) and a detailed description of the animal. Be creative and give your animal a personality, but be specific to the animal you are writing about. Use this space for your good copy. If you need more space, you may use your own paper.

End of Part A

Share your story with your learning facilitator.

Part B

Investigation

Refer to Activity 5-12 on page 278 in your textbook.

2. Do steps 1 and 2 of the procedure.

3. Answer questions 1, 2, and 3 of Analysis.

Textbook question 1:

_____

_____

_____

Textbook question 2:

_____

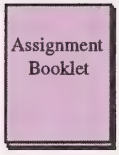
_____

Textbook question 3:

Check your answers with your learning facilitator.

Conclusion

You and all other animals on Earth belong to the Kingdom Animalia. All animals are multicellular heterotrophic organisms and, for this reason, have been grouped together. The differences among animals can be attributed to the environment that each has adapted to. Animals owe their survival to a number of factors that include a favourable environment, a consistent food supply, and successful reproduction.



ASSIGNMENT

Turn to your Assignment Booklet and do the assignment for Section 6.

MODULE SUMMARY

You have discovered that there is a large diversity of living things on Earth. All organisms live in one environment or another, from the sea floor to the driest desert. Each organism has its own structural adaptations for protection, obtaining food, movement, and reproduction. The behavioural adaptations that each organism possesses helps it survive from one generation to the next.

Nature has set the pattern for survival. The theory of natural selection explains how the species with the best traits survive and reproduce. The variations within species and the natural selection of individuals will continue. New species will slowly evolve to replace the older ones as the environments change.

Appendix

Glossary

Adaptation
- a structure or behaviour that increases an organism's chance of survival in a particular environment

Allele
- two or more genes that are coded for the same trait

Artificial selection
- the deliberate selection of organisms with desired traits for use as breeding pairs

Dichotomous key
- a list of alternative characteristics used for classification

Dominant gene
- a gene that causes a particular trait to be visible or otherwise apparent in a mature organism

Egg cell
- the female reproductive cell

Embryo
- an early form of a developing organism where a complete set of organs has not yet formed

Fertilization
- the union of sperm and egg to form a zygote or fertilized egg

Fetus
- a developing organism where a complete set of organs is present

Gene
- a unit of chemical code in the nucleus of a cell that controls the reproduction of a specific trait

Hierarchy
- a system of grouping by levels where groups at each level are subdivided to produce subgroups at a lower level

Mimicry
- a defence mechanism whereby one organism is protected from predators by a close resemblance to another organism

Mutualism
- a relationship between two organisms in which each receives a benefit from the other

Natural selection
- a process in nature whereby organisms not suited for their environment do not survive. In this way, the better adapted organisms are selected as a breeding population.

Recessive gene	• a gene that carries the code for a particular trait even though this trait may not be visible or otherwise apparent in a mature organism
Sperm	• the male reproductive cell
Trait	• a term used to describe a characteristic of an organism that is inherited from a parent organism

Suggested Answers

Section 1: Activity 2

1. Any one of the following similarities may be listed: all have shape, all have veins, and all have similar green colour.

   Any two of the following differences may be listed: different shapes, clusters or single attachment to stem, sizes, number of leaflets attached to one main stock.

2. In cooler or dry climates, leaves are smaller and thinner to prevent too much water loss. In warm and humid climates, leaves are larger to absorb more sunlight. The shape and size of a leaf are therefore related to their survival.

3. Organisms with the same set of adaptations form a species. Different species might only differ by one feature. Reproduction only occurs within one species.

4. Differences would include wing shapes, wing patterns, and colours, as well as body sizes and shapes.

Section 1: Activity 4

1.

Variation	Brief Description	Possible Adaptive Value	Example of Species
Meta-morphosis	During the life cycle, the organism changes in appearance. New structures may appear (e.g., wings). Old structures may disappear (e.g., legs, gills).	There is less competition for food between organisms of the same species.	Butterfly Frog Beetle
Sexual Dimorphism	**The males and females look very different (e.g., in colour).**	• **to attract a mate** • **camouflage from predators**	Peacock Paper Nautilus
Polymorphism	**Each form has adaptions for a particular function.**	**to distribute the many jobs in order for a colony to survive**	**Termites** **Ants** **Bees**

2. Six examples are stated in the textbook. You may use two or three of these examples.

   Sample answer: Fawns are spotted or striped, whereas adult deer are solid in colour. This may provide camouflage for the fawn, which cannot run quickly from predators. Young seals are white so that they blend into the snow until they are capable of swimming away from predators.

3. You may use the examples from the textbook or may use other examples.

   Sample answer: The weasel and arctic hare are white in the winter to blend into the snow and allude predators. They have brown colouring in the summer for the same reason.

4.

Column A	Column B
___c___ morph	a. many
___d___ meta	b. two
___b___ di	c. form
___a___ poly	d. change

5. metamorphosis: the extreme changes that occur in the life cycles of some animals

   sexual dimorphism: the presence of males and females with different characteristics in a species

   polymorphism: many forms of the organism are seen in the same species

Section 1: Follow-up Activities

Enrichment

1. The description of the adaptions in each stage of the life cycle might include the following:

   - egg: Hundreds of eggs in a bunch are surrounded by a jelly-like substance near the top of the water for protection and to absorb heat from the sun.

   - tadpole: Once hatched, the tadpole swims through the water with the aid of its tail. It eats algae and protists with its mouth. The gills enable it live in the water. As it matures and grows, the tadpole develops hind legs to swim faster for protection and to capture food. As front legs develop, the tadpole also develops internal lungs that will enable it to emerge onto land near water.

- young frog: With lungs the young frog can breathe air and manage life activities on land. Its mouth and quick tongue are adapted to capture insects. The short tail is absorbed and the frog uses its legs and webbed feet to move on land and through water.

- adult frog: Each structure of the frog is strongly developed for protection, movement, and food gathering. To ensure survival, internal organs for reproduction mature and the life cycle continues.

Section 2: Activity 2

1. Examples of asexual reproduction may include such things as bulbs, runners, and shoots in plants, or budding and cell division in animals.

2. Sexual reproduction requires the union of two sex cells or gametes. The male sex cell is the sperm and the female sex cell is the egg. They join together during fertilization to form a zygote.

3. The colour of the offspring will be black since the gene for the colour black is dominant.

4. Inheritance of genes through sexual reproduction is a benefit because a wider variety of traits can be combined to provide a source of variations in offspring. Variations in a population may provide helpful adaptions in a changing environment.

Section 2: Follow-up Activities

Extra Help

1. You may suggest improvements such as high milk production, hardiness, resistance to disease, well-developed udders for easy milking, and high quality milk.

2. No, you could not tell if an offspring will develop traits such as high milk production until the cow actually produces milk. The male offspring would never show this characteristic, although it may appear in cows of future generations.

3. The next step is to use the best cattle as breeding stock for a new generation.

4. The dairy would probably have a high quality of milk produced as result of this selective breeding program. Some other undesirable traits may be associated with the high milk production of the herd, such as short life span of the animal.

5. You should be able to support your opinion with a logical and clear statement.

   Sample answer: Yes, I agree with selective breeding because I will get more income from higher milk production from fewer cows. This means a saving of labour, feed costs, and equipment costs. The consumer is also guaranteed a better product.

Section 3: Activity 2

1. If the factories continue to reduce smoke emissions, the trees will have less black residue on them. The black moths will be more noticeable to the birds and the white moths will be less noticeable to the birds. In time, the population of white moths will increase and the number of black moths will decrease because of this change in their environment.

Section 3: Activity 3

1. • At first, the tree trunks around England were light-coloured. The moths that lived and fed on the tree trunks were light-coloured with dark spots. These moths sometimes produced a moth that had many dark spots or that was totally dark-coloured. These dark-coloured moths were easy for the birds to find and eat, so they did not have many successful matings to reproduce the trait.

   • As the cities of England grew, more smoke was produced by industries. The smoke settled in the forested areas around the industries. The smoke-darkened tree trunks no longer offered camouflage to the light-coloured moths.

   • The birds increasingly fed on the light-coloured moths, while the dark-coloured moths were able to mate and survive to pass on their dark-coloured traits to their offspring.

   • Over time, the dark-coloured moths increased in population and the light-coloured moths decreased in population.

2. The healthiest, strongest, smartest, quickest, and otherwise well-adapted organisms have a better chance of survival.

Section 3: Activity 4

1. Textbook question 1:

   They developed different forms of traits because they were separated by a natural barrier. The barrier created a different environment in each area. Specific traits were needed to survive in each environment. For example, the fish in the smaller, drier lake adapted to eat the plant growth on the bottom. Their fins are wider to help them swim slowly while eating. Their mouth points downward to scrape the food off the bottom of the lake.

   Textbook question 2:

   If the water levels were to rise and create one environment, the species may not interbreed. The species may have different behaviours, adaptations, and enough genetic variation to prevent them from interbreeding. Since one fish lives at the bottom and other in the middle of the lake, they might not meet each other. They may also have different mating behaviours. Their genes might not produce fertile eggs.

2. Microscopic organisms would develop new species in a short period of time because their life cycle is shorter than that of more complex organisms. They multiply in great numbers very quickly.

3. You should base your hypothesis on the resemblances among the species. On the basis of physical resemblances, the dog and wolf are closely related. The horse, donkey, and zebra form another group of closely related species. The bear, being a mammal, has some relatedness to the species already mentioned, but the relationship is more distant.

4. Some of the similar inherited traits shared by zebras and horses are strong hooves, body shape, strong legs for running, and the sounds they produce.

5. The zebra has markings on it that make it difficult for predators to pick one particular zebra out of a moving herd. It can run fast with its strong legs and it eats the grass from the environment it lives in. The horse is also adapted to live in a grassland or prairie environment. Both horses and zebras have strong legs to run from predators, and both have a mouth and digestive system adapted for feeding on grass.

Section 3: Follow-up Activities

Enrichment

1. At first, the grasshopper population decreased because the pesticide DDT was effective on most grasshoppers. However, some of the grasshoppers were not as affected by DDT and continued to reproduce. Over many generations, the proportion of grasshoppers that was resistant to DDT increased and the pesticide eventually proved to be ineffective.

2. Biological controls can be used to control insect pests. Bacteria that cause a disease that only affects grasshoppers have been developed. Birds and other predators also help to keep insect populations in check. Other methods might involve the destruction of breeding habitats or food supplies. Draining ponds can control mosquitoes. Proper waste management can reduce the numbers of houseflies.

3. These methods are less polluting and can be used to reduce consumption of chemical sprays or used on crops where sprays are not desirable.

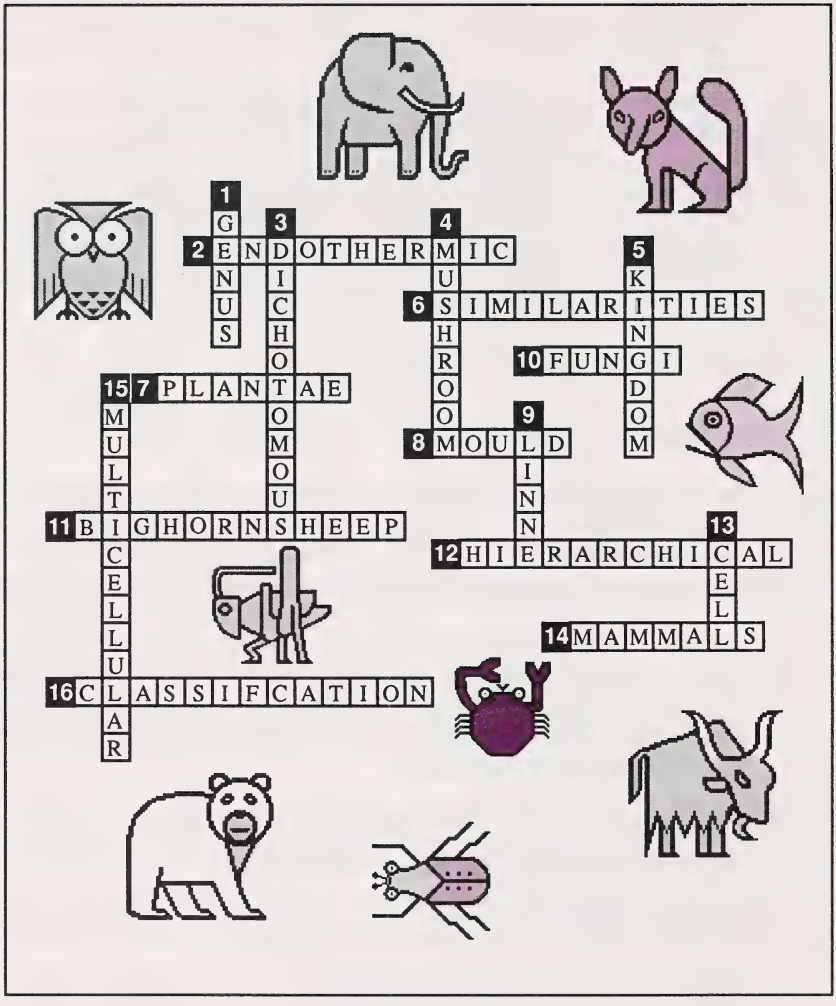
Section 4: Activity 3

1. You should identify the following animals.

    a. moose
    b. white-tailed deer
    c. caribou
    d. mountain goat
    e. wapiti (American elk)
    f. bighorn sheep
    g. mule deer

Section 4: Follow-up Activities

Extra Help


1 G N U S
2 ENDOTHERMIC
3 I C H O
4 M U H R O O
5 K I N D O M
6 SIMILARITIES
7 PLANTAE O M O U
8 MOULD
9 I N N
10 FUNGI
11 BIGHORNSHEEP
12 HIERARCHICAL
13 E L
14 MAMMALS
15 M U L T
16 CLASSIFCATION C E L L U A R

Section 5: Activity 1

1. photosynthesis: a process that takes place in green plants. In the presence of sunlight, the plant uses chlorophyll to make a simpler sugar or food from water and carbon dioxide. All green plants photosynthesize.

2. autotroph: an organism that has the ability to make its own food

3. a. Mosses and liverworts belong to the phylum Bryophyta.

   b. They live in moist areas such as forests or swamps.

   c. • do not have true roots, therefore they cannot live in dry areas
   • conduct water via diffusion
   • most mosses are green, thin, tiny plants

   d. Bryophyta can survive during dry spells by becoming dormant.

   e. Asexual and sexual reproduction both occur.

   f. Spores give rise to new moss and liverworts.

4. a. Ferns belong to the phylum Filicinophyta.

   b. Ferns live on land, usually in moist areas such as forests.

   c. • have true roots and transport water through their vascular tissues
   • have underground stems called rhizomes
   • have long large leaves, called fronds, which grow up from the rhizomes
   • only a few known species

   d. Filicinophyta can transport water quickly through the vascular tissues and have a large surface on the leaves to absorb sunlight and produce more food.

   e. Ferns reproduce by both sexual and asexual reproduction during their life cycle.

Section 5: Activity 2

1. The two main groups of seed-bearing plants are the gymnosperms, or "exposed-seed plants", and the angiosperms, the "enclosed-seed plants." The seeds of gymnosperms are on cones, branches, or among leaves. The seeds of an angiosperm are enclosed in a fruit.

2. a. Phylum Coniferophyta is the best known phylum of "exposed-seed plants".

b. • produce exposed seeds on cones
• have needle-like leaves
• includes, pines, spruce, fir, and cedar trees

c. • Cones are used in sexual reproduction. A male cone supplies the pollen and a female cone protects the seed after fertilization.

• Needles remain in place all year round so that photosynthesis is possible even in winter.

d. Sexual reproduction is used.

3. a. Flowering plants belong to Angiospermophyta.

b. Variations in the structure of flowers is used to divide angiosperms into families.

c. • they are the dominant form of plant type on land
• they produce a wide variety of flowers
• they produce their own food and have true roots
• they produce a seed that is enclosed in a fruit

d. The main adaptations of this group are as follows:
• flowers that contain both male and female gametes
• use of insects as well as wind for pollination
• seeds are enclosed in a seed pod or fruit

e. Sexual reproduction is the main method used by angiosperms, although asexual reproduction is also possible.

Section 6: Activity 1

1. heterotroph: organism that obtains its energy by consuming other organisms

2. You may select any three of the following characteristics:
• heterotrophic
• multicellular with specialized tissues and organs
• live on land, water, or inside other organisms
• most are mobile
• reproduce sexually or asexually

3. Plants manufacture their own food (autotrophs) and animals obtain their energy by consuming other organisms (heterotrophs).

Section 6: Follow-up Activities

Extra Help

1. Your answers may be different. Some may be quite humorous. The following sample answers are examples only.

   a. Porifera: all pores, mouth and water
   b. Cnidaria: tentacle dancers
   c. Platyhelminthes: one-eyed flat arrow head
   d. Nematoda: sneaky round worm
   e. Annelida: down to earth and segmented
   f. Mollusca: the soft body with a hard shell
   g. Echinodermata: the five-arm sucker
   h. Arthropoda: wild and free critters

2. a. Insects belong to the phylum Arthropoda.

   b. A soft-bodied animal that has many tentacles is the octopus.

   c. A type of flatworm which is parasitic is the tapeworm or fluke.

   d. The simplest class of vertebrates with only two living species is the jawless fish.

   e. Birds are the only animals which have hollow bones for flight and feathers.

   f. The class of vertebrates which lay leathery eggs are the reptiles.

   g. A life cycle represents the stages of the development of most animals.

Science 9

9SC09P15

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FIRST EDITION
1992